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Clinical Research

Long-Term Clinical Outcomes After Percutaneous Coronary Intervention Versus Coronary Artery Bypass Grafting for Ostial/Midshaft Lesions in Unprotected Left Main Coronary Artery From the DELTA Registry

A Multicenter Registry Evaluating Percutaneous Coronary Intervention Versus Coronary Artery Bypass Grafting for Left Main Treatment

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Objectives The aim of this study was to report the long-term clinical outcomes after percutaneous coronary intervention (PCI) with drug-eluting stents (DES) versus coronary artery bypass grafting (CABG) for ostial/midshaft lesions in an unprotected left main coronary artery (ULMCA).

Background Data regarding outcomes in these patients are limited.

Methods Of a total of 2,775 patients enrolled in the DELTA multinational registry, 856 patients with isolated ostial/midshaft lesions in an ULMCA treated by PCI with DES (n = 482) or CABG (n = 374) were analyzed.

Results At a median follow-up period of 1,293 days, there were no significant differences in the propensity score–adjusted analyses for the composite endpoint of all-cause death, myocardial infarction (MI), and cerebrovascular accident (hazard ratio [HR]: 1.21, 95% confidence interval [CI]: 0.79 to 1.86; p = 0.372), all-cause death (HR: 1.35, 95% CI: 0.80 to 2.27; p = 0.255), the composite endpoint of all-cause death and MI (HR: 1.33, 95% CI: 0.83 to 2.12; p = 0.235) and major adverse cardiac and cerebrovascular events (HR: 1.34, 95% CI: 0.93 to 1.93; p = 0.113). These results were sustained after propensity-score matching. However, a higher incidence of target vessel revascularization (HR: 1.94, 95% CI: 1.03 to 3.64; p = 0.039) was observed in the PCI compared with the CABG group, with a trend toward higher target lesion revascularization (HR: 2.00, 95% CI: 0.90 to 4.45; p = 0.090).

Conclusions This study demonstrates that PCI for ostial/midshaft lesions in an ULMCA is associated with clinical outcomes comparable to those observed with CABG at long-term follow-up, despite the use of older first-generation DES. (J Am Coll Cardiol Intv 2014;7:354–61) © 2014 by the American College of Cardiology Foundation

The left main coronary artery can be divided into 3 segments: ostial, midshaft, and distal bifurcation. Previous studies have reported that percutaneous coronary intervention (PCI) with drug-eluting stents (DES) for ostial/midshaft lesions in an unprotected left main coronary artery (ULMCA) is associated with better clinical outcomes than PCI for distal bifurcation lesions (1–3). Possible reasons for this include the fact that ostial/midshaft lesions are in general simpler to treat as they do not involve the bifurcation and that vessel diameter at this location tends to be larger compared with that in distal bifurcation ULMCA sites, thus allowing the use of larger diameter stents. This is reflected in the current guidelines in which PCI for ostial/midshaft ULMCA lesions receives a Class IIa recommendation compared with Class IIb for distal bifurcation ULMCA lesions. However, coronary artery bypass grafting (CABG) is still considered the gold standard (Class I) (4) for this lesion subset, although this has not been thoroughly examined. In the substudy of the MAIN COMPARE (Revascularization for Unprotected Left Main Coronary Artery Stenosis: Comparison of Percutaneous Coronary Angioplasty Versus Surgical Revascularization) study by Lee et al. (5) (n = 263), PCI for ostial lesions demonstrated event rates similar to those with CABG for the composite endpoint of death, myocardial infarction (MI), stroke, and target vessel revascularization (TVR). The aim of this study was to compare the long-term clinical outcomes of PCI with those of CABG, not only for ostial but also for midshaft ULMCA lesions in an all-comer, larger, international population.

Methods

The methods of the DELTA registry were published previously (6). In brief, the registry includes all-comer patients with ULMCA disease treated with PCI or CABG between April 2002 and April 2006 in 14 centers. Of the 2,775 patients, 1,118 (40.3%) had ostial/midshaft lesions. A total of 262 patients who were treated with PCI were excluded as stenting involved both the ostium/midshaft and distal bifurcation sites. Thus, the remaining 482 patients with isolated ostial/midshaft lesions (not involving the distal left main bifurcation) (PCI group) were compared with 374 patients treated with CABG (CABG group). Dual antiplatelet therapy (i.e., aspirin 100 mg daily and clopidogrel 75 mg daily or ticlopidine 250 mg twice daily) was administered for at least 12 months in the PCI group. In the South Korean center, cilostazol was also prescribed. Angiographic follow-up was scheduled according to local guidelines or if a noninvasive evaluation or clinical presentation suggested ischemia. Data analysis was performed with the approval of the institutional ethics committees of the hospitals and/or universities involved.

Definitions. In this study, the following events were analyzed cumulatively at the latest clinical follow-up available: cardiac and all-cause death, MI, target lesion revascularization (TLR), and TVR. Major adverse cardiac cerebrovascular events (MACCE) were defined as the composite endpoint of all-cause death, MI, cerebrovascular accidents (CVA), and TVR. The occurrence of stent thrombosis (ST) was defined on the basis of the Academic Research Consortium definitions (7) in the PCI group. Death was classified as either cardiac or noncardiac. Cardiac death was defined as any death of a cardiac cause (e.g., MI, low-output failure, or fatal arrhythmia), procedure-related death, and death of unknown cause. TLR was defined as any repeat intervention of the target lesion or other complication of the target lesion. The target lesion was defined as the treated segment 5 mm proximally and 5 mm distally to the stent. TVR was defined as any repeat intervention of any segment of the target vessel, defined as the entire major coronary vessel proximal and distal to the target lesion, including upstream and downstream branches and the target lesion itself. CVA were defined as stroke, transient ischemic attacks, and reversible ischemic neurological deficits adjudicated by a neurologist and confirmed by computed tomography scanning. In-hospital non–Q-wave MI was defined as the elevation of the serum creatine kinase (CK) isoenzyme myocardial band that was 3 times the upper limit of normal in the PCI group and 5 times the upper limit of

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normal in the CABG group, in the absence of new pathological Q waves. In this analysis we included as cumulative MIs all Q-wave MIs that occurred during hospital stay and follow-up and all spontaneous MIs occurring after hospital discharge. Q-wave MI was defined as the development of new pathological Q waves in ≥2 contiguous leads with or without CK or CK-myocardial band levels elevated above normal. Spontaneous MI was defined as the occurrence after hospital discharge of any value of troponin and/or CK-myocardial band greater than the upper limit of normal if associated with clinical and/or electrocardiogram change. The European System for Cardiac Operative Risk Evaluation (EuroSCORE) was calculated. Diagnostic angiograms were scored according to the SYNTAX (Synergy Between PCI With Taxus and Cardiac Surgery) score algorithm at the site laboratory (8).

Abbreviations and Acronyms

CABG = coronary artery bypass grafting
CI = confidence interval
CK = creatine kinase
CVA = cerebrovascular accident(s)
DES = drug-eluting stent(s)
EuroSCORE = European System for Cardiac Operative Risk Evaluation
HR = hazard ratio
MACCE = major adverse cardiac and cerebrovascular event(s)
MI = myocardial infarction
PCI = percutaneous coronary intervention
ST = stent thrombosis
TLR = target lesion revascularization
TVR = target vessel revascularization
ULMCA = unprotected left main coronary artery

Study endpoints. The primary study endpoint was the occurrence of the composite of all-cause death, MI, and CVA at long-term follow-up. Secondary endpoints were occurrence of all-cause death and the composite of all-cause death and MI, MACCE, TVR, and TLR at long-term follow-up.

Statistical analysis. Data are presented as percentages and mean ± SD. In general, differences in proportions were tested with chi-square test or Fisher exact test, and differences in continuous variables were tested with a Student *t* test. Cumulative event curves were generated with the Kaplan-Meier method and compared by the log-rank test. Because of the nonrandomized nature of the study, a propensity-score analysis was performed to minimize any selection bias due to the differences in clinical characteristics between the 2 groups. Briefly, for each patient, a propensity score indicating the likelihood of having PCI was calculated by using a nonparsimonious multivariable logistic regression. A propensity score, indicating the predicted probability of receiving a specific treatment conditional on the observed covariates, was then calculated from the logistic equation for each patient. Variables with $p < 0.20$ on univariate analysis were included in the logistic regression model to calculate the propensity score. These were age, sex, hypertension, diabetes mellitus, chronic kidney disease, EuroSCORE, unstable angina, acute MI, multivessel disease, and concomitant right coronary artery disease. The C-statistic was 0.77 and the Hosmer-Lemeshow test p value was 0.58, confirming good discrimination and goodness-of-fit of the propensity-score model, respectively. The individual propensity score was incorporated into Cox proportional hazards regression models as a covariate as well as treatment group as the variable of interest to calculate the adjusted hazard ratio (HR). In addition, to reduce the effect of treatment-selection bias and potential confounding in this observational study, we performed rigorous adjustment for significant differences in the baseline characteristics of patients with propensity-score matching. Clinical outcomes in the matched population were analyzed with Cox proportional hazards regression stratified on matched pairs. Multivariable Cox proportional hazards regression modeling was performed to determine the independent predictors of MACCE with purposeful selection of covariates. Variables associated on univariate analysis (all with a p value <0.1) and those judged to be of clinical importance from previous published reports were eligible for inclusion in the multivariable model-building process. The goodness-of-fit of the Cox multivariable model was assessed with the Grønnesby-Borgan-May test. Results are reported as HR with associated 95% confidence interval (CI) and p value. Analyses were carried out using SPSS for Windows, version 19.0 (IBM SPSS Inc., Chicago, Illinois).

Results

The study population flowchart is shown in Figure 1. A total of 856 patients were included: 482 treated with PCI and 374 with CABG. Baseline clinical characteristics are summarized in Table 1 and demonstrate that patients in the PCI group were more frequently male (73.0% vs. 61.8%, $p < 0.001$), were younger (64.3 ± 11.3 years vs. 66.8 ± 10.0 years, $p = 0.001$), had a lower EuroSCORE (4.5 ± 3.4 vs. 5.2 ± 2.6, $p = 0.003$), and had a lower prevalence of hypertension (63.7% vs. 70.6%, $p = 0.034$) and diabetes mellitus (26.3% vs. 36.9%, $p = 0.001$). There was, however, a higher prevalence of chronic kidney disease (8.3% vs. 4.5%, $p = 0.029$) and ST-segment elevated MI in the PCI group (3.7% vs. 0.2%, $p = 0.001$). Lesion and procedural characteristics are illustrated in Table 2. As expected, in the PCI group, the SYNTAX score was lower (26.1 ± 12.3 vs. 35.5 ± 13.1, $p < 0.001$) with lower occurrence of multivessel disease (70.1% vs. 90.4%, $p < 0.001$) and concomitant right coronary artery disease (34.0% vs. 59.1%, $p < 0.001$).

In-hospital and follow-up MACCE. The median follow-up period was 1,293 days (interquartile range: 989 to 1,703 days). In-hospital and follow-up MACCE are illustrated in Table 3. Definite ST occurred in 3 patients (0.6%), whereas probable ST was adjudicated to 3 patients (0.6%). Of note, angiographic follow-up rates in the PCI and CABG groups were 56.8% versus 10.2%, respectively ($p < 0.001$).

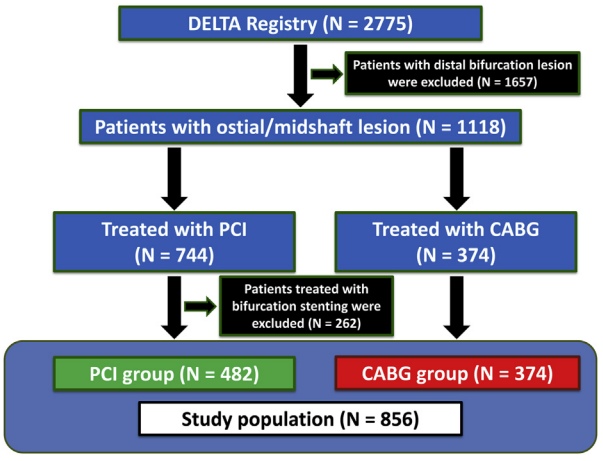

Figure 1. Study Population Flowchart

CABG = coronary artery bypass grafting; PCI = percutaneous coronary intervention.

Study endpoints. No significant differences in the composite endpoint of all-cause death, MI, and CVA (unadjusted HR: 1.05, 95% CI: 0.75 to 1.46; p = 0.793; propensity score–adjusted HR: 1.21, 95% CI: 0.79 to 1.86; p = 0.372), all-cause death (unadjusted HR: 1.24, 95% CI: 0.82 to 1.88; p = 0.307; propensity score–adjusted HR: 1.35, 95% CI: 0.80 to 2.27; p = 0.255), the composite endpoint of death and MI (unadjusted HR: 1.09, 95% CI: 0.76 to 1.57; p = 0.623; adjusted HR: 1.33, 95% CI: 0.83 to 2.12; p = 0.235), and MACCE (unadjusted HR: 1.33, 95% CI: 0.99 to 1.78; p = 0.059; propensity score–adjusted HR: 1.34, 95% CI: 0.93 to 1.93; p = 0.113) were seen between the 2 groups. A higher TVR (unadjusted HR: 2.15, 95% CI: 1.21 to 3.80; p = 0.009; propensity score–adjusted HR: 1.94, 95% CI: 1.03 to 3.64; p = 0.039) was observed in the PCI group with a trend toward higher TLR (unadjusted HR: 2.03, 95% CI: 0.98 to 4.21; p = 0.057; propensity score–adjusted HR: 2.00, 95% CI: 0.90 to 4.45; p = 0.090).

Kaplan-Meier survival curves for all-cause death, the composite endpoint of all-cause death and MI, MACCE, and the composite endpoint of all-cause death, MI, and CVA are illustrated in Figure 2.

Multivariable analysis for predictors of primary endpoint. At Cox regression multivariable analysis, PCI for ostial/midshaft ULMCA lesions did not affect the primary endpoint (HR: 0.99, 95% CI: 0.64 to 1.52; p = 0.948). Age (HR: 1.03, 95% CI: 1.01 to 1.06; p = 0.014), and EuroSCORE (HR: 1.09, 95% CI: 1.01 to 1.17; p = 0.039) were predictors of the primary endpoint (Table 4).

Propensity score–matched analysis. After propensity-score matching was performed, 209 pairs were matched. Baseline clinical and lesion characteristics of the matched groups are available in the Online Table. After propensity-score matching, no significant differences in the composite endpoint of all-cause death, MI, and CVA (HR: 1.25, 95% CI: 0.78 to 2.01; p = 0.350), all-cause death (HR: 1.31, 95% CI: 0.74 to 2.32; p = 0.348), the composite endpoint of death and MI (HR: 1.38, 95% CI: 0.82 to 2.31; p = 0.220), and MACCE (HR: 1.40, 95% CI: 0.93 to 2.10; p = 0.104) were noted between the 2 groups. There was, however, a trend toward higher TVR (HR: 1.97, 95% CI: 0.97 to 4.00; p = 0.060) and TLR (HR: 2.23, 95% CI: 0.93 to 5.37; p = 0.073) in the PCI group. Kaplan-Meier survival curves for all-cause death, the composite endpoint of all-cause death and MI, MACCE, and the composite endpoint of all-cause death, MI, and CVA are illustrated in Figure 3.

Table 1. Baseline Clinical Characteristics

	PCI (n = 482)	CABG (n = 374)	p Value
Male	352 (73.0)	231 (61.8)	<0.001
Age, yrs	64.3 ± 11.3	66.8 ± 10.0	0.001
Family history of CAD	149 (30.9)	96 (25.7)	0.092
Hypertension	307 (63.7)	264 (70.6)	0.034
Dyslipidemia	284 (58.9)	240 (64.2)	0.106
Smokers	231 (47.9)	169 (45.2)	0.426
Diabetes	127 (26.3)	138 (36.9)	0.001
IDDM	25 (5.2)	24 (6.4)	
NIDDM	102 (21.2)	114 (30.5)	
Chronic kidney disease	40 (8.3)	17 (4.5)	0.029
Clinical presentation			
Stable angina/silent ischemia	244 (50.6)	121 (32.4)	<0.001
Unstable angina	166 (34.4)	197 (52.7)	<0.001
NSTEMI	54 (11.2)	55 (14.7)	0.127
STEMI	18 (3.7)	1 (0.2)	0.001
Previous PCI	130 (27.0)	56 (15.0)	<0.001
LVEF, %	53.9 ± 12.3	53.5 ± 12.0	0.565
EuroSCORE	4.5 ± 3.4	5.2 ± 2.6	0.003

Values are n (%) or mean ± SD.

CABG = coronary artery bypass grafting; CAD = coronary artery disease; EuroSCORE = European System for Cardiac Operative Risk Evaluation; IDDM = insulin-dependent diabetes mellitus; LVEF = left ventricular ejection fraction; NIDDM = non–insulin-dependent diabetes mellitus; NSTEMI = non–ST-segment elevation myocardial infarction; PCI = percutaneous coronary intervention; STEMI = ST-segment elevation myocardial infarction.

Discussion

The main findings of this large, multicenter, multinational, all-comer registry are the following:

1. PCI for ostial/midshaft lesions with first-generation DES appears to be associated with clinical outcomes comparable to those seen with CABG at long-term follow-up. Event rates for the primary endpoint of all-cause death, MI, and CVA as well as for MACCE were found to be similar between the 2 groups.

Table 2. Lesion and Procedural Characteristics

	PCI (n = 482)	CABG (n = 374)	p Value
Multivessel disease	338 (70.1)	338 (90.4)	<0.001
RCA disease	164 (34.0)	221 (59.1)	<0.001
SYNTAX score*	26.1 ± 12.3	35.5 ± 13.1	<0.001
IABP	15 (3.1)	15 (4.0)	0.478
IVUS	161 (33.4)		
Vessels treated	1.17 ± 0.78	2.29 ± 0.98	<0.001
PCI for LAD or LCx	243 (50.4)		
PCI for RCA	67 (13.9)		
DES type			
SES	281 (58.3)		
PES	199 (41.3)		
ZES/EES	2 (0.4)		
Mean stent diameter, mm	3.51 ± 0.36		
Mean stent length, mm	15.9 ± 13.5		
Maximal balloon diameter, mm	3.88 ± 0.58		
Maximal pressure, atm	16.7 ± 3.6		
Mean arterial graft		1.9 ± 1.1	
Mean venous graft		1.6 ± 1.2	

Values are n (%) or mean ± SD. *The availability of SYNTAX score is 63.8%.

DES = drug-eluting stent(s); EES = everolimus-eluting stent(s); IABP = intra-aortic balloon pump; IVUS = intravascular ultrasound; LAD = left anterior descending artery; LCx = left circumflex artery; PES = paclitaxel-eluting stent(s); RCA = right coronary artery; SES = sirolimus-eluting stent(s); SYNTAX = Synergy Between PCI With Taxus and Cardiac Surgery; ZES = zotarolimus-eluting stent(s); other abbreviations as in Table 1.

Table 3. Cumulative Incidence of In-Hospital and Follow-Up MACCE

	PCI (n = 482)	CABG (n = 374)
In-hospital events		
All-cause death	12 (2.5)	8 (2.1)
Cardiac death	11 (2.3)	4 (1.1)
Noncardiac death	1 (0.2)	4 (1.1)
MI	18 (3.7)	84 (22.5)
Q-wave MI	4 (0.8)	5 (1.3)
Non–Q-wave MI	14 (2.9)	79 (21.2)
Target lesion revascularization	0	0
Target vessel revascularization	5 (1.0)	2 (0.5)
Cerebrovascular accidents	3 (0.6)	5 (1.3)
MACCE	21 (4.3)	20 (5.3)
Events at follow-up		
All-cause death	46 (9.5)	29 (7.7)
Cardiac death	26 (5.4)	15 (4.0)
Noncardiac death	20 (4.1)	14 (3.7)
MI	20 (3.9)	18 (4.8)
Target vessel revascularization	45 (9.3)	14 (3.7)
Cerebrovascular accidents	8 (1.7)	8 (2.1)
MACCE	97 (20.1)	58 (15.5)

Values are n (%).

MACCE = major adverse cardiac and cerebrovascular event(s); MI = myocardial infarction; other abbreviations as in Table 1.

2. A higher TVR was observed in the PCI group with a trend toward higher TLR compared with the CABG group. There was, however, a significantly higher angiographic follow-up rate in the PCI group, and we cannot thus exclude that this practice, popular during the early experience with DES, may have influenced the repeat intervention rate observed in this group.

The main DELTA study, in which ULMCA PCI, irrespective of lesion location was compared with CABG, demonstrated higher MACCE rate with PCI largely due to a higher incidence of TVR. In agreement with other studies, however, no differences were noted in the primary endpoint of all-cause death, MI, and CVA (6,9–11). In the current substudy from the DELTA registry, specifically focusing on ostial/midshaft lesions, no significant differences were observed between the 2 strategies, not only in the aforementioned primary endpoint but also in MACCE. Despite the fact that other studies have examined the role of PCI compared with CABG in the treatment of ULMCA disease, the impact of lesion location has not been fully evaluated. This is particularly important considering the prevalence of ostial/midshaft lesions (19% to 51%) (6,9,11–13). In the only study that has examined this, Lee et al. (5) reported that PCI for ostial ULMCA lesions was associated with similar MACCE and TVR rates compared with CABG. This, however, was a small study (n = 123 in PCI group vs. n = 140 in CABG group) and, as the authors acknowledge, was likely underpowered to detect clinically significant differences in TVR and composite outcomes. Furthermore, in this study, only ostial lesions were considered. In contrast, our study not only was larger (n = 482 in the PCI group vs. n = 374 in the CABG group) but also included midshaft lesions, thus reflecting more accurately everyday clinical practice. In addition, the relatively large population size in our study allowed for the generation of propensity score–matched groups in sufficient numbers for meaningful conclusions to be made. Our results demonstrate that the treatment of ostial/midshaft ULMCA lesions with PCI is associated with long-term outcomes similar to those observed with CABG for the same lesion subset. In agreement with this, the SYNTAX trial showed similar MACCE rates with PCI in left main coronary artery patients with low (0 to 22) or intermediate (23 to 32) scores, whereas those with high SYNTAX scores (≥33) demonstrated higher MACCE rate compared with CABG at 5-year follow-up (10). With regard to revascularization, TVR was found to be more common in the PCI group, although it is unclear from our study whether the higher TVR rate also corresponded to a higher TLR rate; the latter did not unequivocally differ between the 2 groups. The significant difference in angiographic follow-up between the 2 groups (56.8% vs. 10.2%) can explain, at least to some extent, the differences noted between the 2 groups in repeat revascularization, as this can trigger the oculostenotic reflex in both treated ULMCA

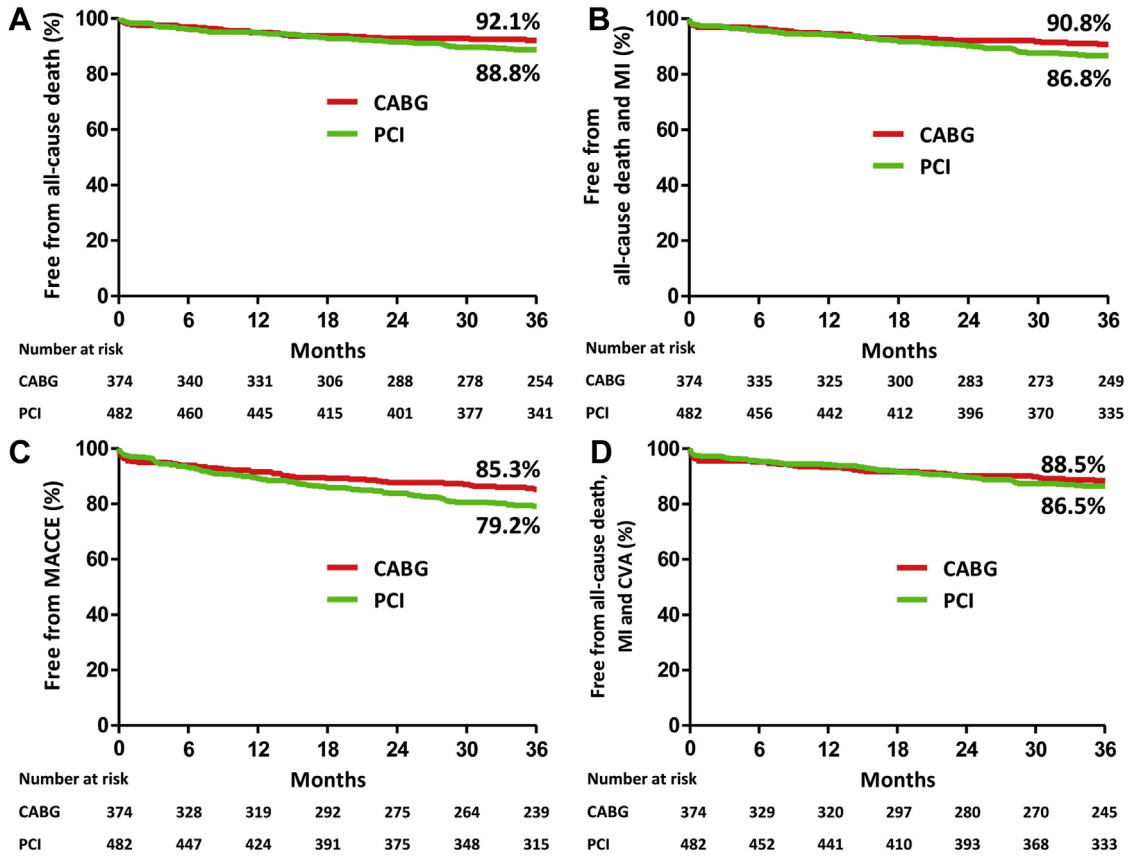

Figure 2. Freedom From Cardiac and Cerebrovascular Events in the PCI Group Versus the CABG Group for Ostial/Midshaft Unprotected Left Main Coronary Artery in the Overall Population

Freedom from all-cause death **(A)**; from the composite endpoint of all-cause death and myocardial infarction (MI) **(B)**; from major adverse cardiac cerebrovascular events (MACCE) **(C)**; and from the composite endpoint of all-cause death, MI, and cerebrovascular accident (CVA) **(D)** in the overall population. Patients at risk at different times are reported **below each graph**. Abbreviations as in Figure 1.

sites that may not require further intervention and in downstream vessels. The relatively small balloon size (3.88 mm) and less frequent intravascular ultrasound use (33.4%) during the learning phase of ULMCA PCI, on the other hand, may have contributed to TLR, which could have been prevented if the current practice of liberal post-dilation and intravascular imaging was used, factors known to affect revascularization (14).

Table 4. Predictors of the Primary Endpoint at Cox Multivariable Analysis

	HR	95% CI	p Value
PCI vs. CABG	0.99	0.64–1.52	0.948
Age	1.03	1.01–1.06	0.014
EuroSCORE	1.09	1.01–1.17	0.039
Female	0.81	0.51–1.30	0.389
Diabetes	1.21	0.77–1.88	0.411
LVEF	0.99	0.97–1.01	0.204
Multivessel disease	1.00	0.55–1.84	0.991
AMI	0.91	0.51–1.62	0.739

AMI = acute myocardial infarction; CI = confidence interval; HR = hazard ratio; other abbreviations as in Table 1.

In summary, our study suggests that PCI for ostial/midshaft lesions is an acceptable treatment option that seems to be equivalent to the gold standard of CABG. Importantly, these results stem from the use of first-generation DES with currently-used devices associated with improved clinical outcomes in real-world patients, both in ULMCA and non-ULMCA PCI compared with their earlier counterparts (15–18). We envisage that the improved efficacy and safety of new-generation DES in conjunction with the increasing use of intravascular ultrasound along with advances in medical therapy will lead to further improvements in clinical outcomes after ostial/midshaft ULMCA PCI. The results of the EXCEL Clinical Trial (Evaluation of XIENCE PRIME™ Everolimus Eluting Stent System [EECSS] or XIENCE V® EECSS or XIENCE Xpedition™ EECSS or XIENCE PRO EECSS Versus Coronary Artery Bypass

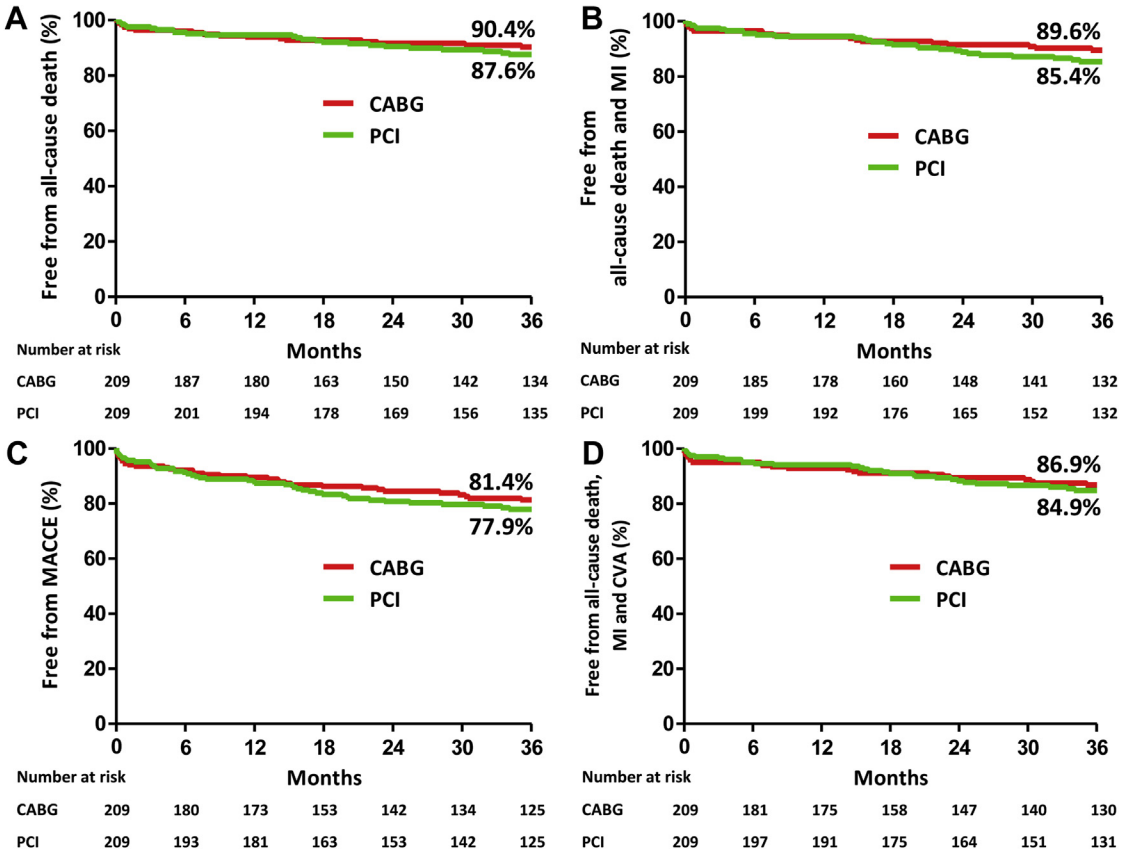

Figure 3. Freedom From Cardiac and Cerebrovascular Events in the PCI Group Versus the CABG Group for Ostial/Midshaft Unprotected Left Main Coronary Artery in the Propensity Score–Matched Groups

Freedom from all-cause death **(A)**; from the composite endpoint of all-cause death and MI **(B)**; from MACCE **(C)**; and from the composite endpoint of all-cause death, MI, and CVA. **(D)** in the propensity score–matched groups. Patients at risk at different times are reported **below each graph**. Abbreviations as in Figures 1 and 2.

Surgery for Effectiveness of Left Main Revascularization; NCT01205776) will shed more light on the subject.

Study limitations. First, this was an observational retrospective study. Therefore, multivariable and propensity-score adjustment was performed to adjust for differences in baseline clinical and lesion characteristics between the 2 groups. In addition, propensity-score matching was also undertaken. Second, the majority of DES used in this study were first-generation DES, and thus our results may not reflect outcomes for ULMCA with the currently-used newer-generation DES. Third, information on symptomatic graft occlusion in the CABG group is not available. Fourth, as we do not have complete data regarding the reasons for repeat revascularization (clinically vs. angiographically driven), we cannot exclude that in some cases the oculostenotic reflex could have driven the repeat revascularization. Equally important is the fact that the exact site of revascularization is not known. Finally, the low availability (63.8%) of SYNTAX score in our cohort did not allow us to use this in the propensity-score analysis.

Conclusions

This study demonstrates that PCI for ostial/midshaft lesions in an ULMCA is associated with comparable clinical outcomes compared with CABG, despite the use of older, first-generation DES.

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Key Words: coronary artery bypass grafting ■ ostial/midshaft lesion ■ percutaneous coronary intervention ■ unprotected left main coronary artery.

APPENDIX

For a supplemental table, please see the online version of this article.